Jaewoo Lee

Ph.D. Applicant @ Seoul, Korea
AI Researcher

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Research Interest

- **Multimodal:** Vision-Language, Audio-Video, Audio-Image
  My ultimate goal is to build a model that understands and communicates through various modalities. This will enhance human-machine interaction and increase the accessibility of AI technology in human life.
- **Efficient training:** Data pruning, Token pruning, Curriculum learning
  To further increase the accessibility of AI technology, addressing the high training costs associated with developing concurrent models (i.e. large-scale datasets, significant GPU consumption) is crucial. I aim to minimize the costs by developing algorithms that identify redundancies in training data and optimize the training order.
- **Beyond Supervised Learning:** Continual learning, Instruction tuning etc.
  Continual learning - interested in developing algorithms that keep models up-to-date with new knowledge.
  Instruction tuning - focused on discovering the structure of skills from Large Vision-Language Models (e.g. OCR, recognizing color, visual reasoning) and using them for effective & efficient instruction tuning.

Education

- **Korea Advanced Institute of Science and Technology (KAIST)** Seoul, South Korea
  Master of Science in Artificial Intelligence (GPA: 3.88/4.3) *Mar. 2023 – Aug. 2024*
  - Advisor: Prof. Sung-Ju Hwang
  - A half-year early graduation.
  - **Thesis:** Efficient Training Techniques for Multimodal Learning
- **Korea Advanced Institute of Science and Technology (KAIST)** Daejeon, South Korea
  Bachelor of Science in Electrical Engineering (GPA: 4.11/4.3) *Mar. 2020 – Feb. 2023*
  - Summa Cum Laude.
  - One-year early graduation.
  - **Selected Coursework:** Programming Structure, Data Structures and Algorithms, Introduction to Optimization Techniques, Information Theory, Machine Learning Basics and Practices, Deep learning for Computer Vision, Engineering Random Processes, Digital Speech Processing, Digital Signal Processing, Communication Engineering.

Publications

[1] **Concept-skill Transferability-based Data Selection for Large Vision-Language Models**
Jaewoo Lee, Boyang Li, Sung Ju Hwang
Conference on Empirical Methods in Natural Language Processing (submitted to EMNLP, 2024)

[2] **STELLA: Continual Audio-Video Pre-training with Spatio-Temporal Localized Alignment**
Jaewoo Lee*, Jaehong Yoon*, Wonjae Kim, Yunji Kim, Sung Ju Hwang (* denotes equal contribution)
International Conference on Machine Learning (ICML, 2024)

[3] **Sound-based drone fault classification using multitask learning**
Wonjun Yi, Jung-Woo Choi, Jaewoo Lee
The 29th International Congress on Sound and Vibration (ICSV29)

Research Experiences

- **MLAI Lab-KAIST** — Seoul, South Korea
  Master's Degree Student Researcher (Advisor: Sung Ju Hwang) — *Mar. 2023 - Aug. 2024*
  - Proposed a visual instruction data pruning method by clustering samples by visual concept-skill compositions and selecting samples based on cluster importance, thereby facilitating efficient fine-tuning of the target model.
  - Suggested audio-video continual pre-training scenarios featuring dynamic multimodal semantics and introduced a novel audio-video patch selection method for continual pre-training, enhancing both performance & efficiency.
- **MLAI Lab-KAIST** — Seoul, South Korea
  Undergraduate Student Researcher (Advisor: Sung Ju Hwang) — *Jul. 2022 - Feb. 2023*
  - Investigated audio-video online continual learning within the context of egocentric video streams.
- **Smart Sound Systems Lab-KAIST** — Daejeon, South Korea
  Undergraduate Student Researcher (Advisor: Jung-Woo Choi) — *Sep. 2021 - Jun. 2022*
  - Bulit UAV anomaly sound dataset containing various faults and maneuvering scenarios and released it in public. *https://zenodo.org/records/7779574#.ZCOvfXZBwQ8).*
  - Developed models that utilize UAV sound signals and Multitask learning techniques to precisely identify anomalous states in UAV operations.
- **Urban Robotics Lab-KAIST** — Daejeon, South Korea
  Undergraduate Student Researcher (Advisor: Hyun Myung) — *Jun. 2021 - Aug. 2021*
  - Worked on Simultaneous Localization and Mapping (SLAM) for autonomous navigation of self-driving cars

Awards & Honors

- **Summa Cum Laude Award** — KAIST
  Graduated with highest honors and a 4.11/4.3 GPA. — *Feb. 2023*
- **National Scholarship for Science & Engineering** — Korea Student Aid Foundation
  Awarded for outstanding academics and potential impact in science and technology. — *Sep. 2022 - Feb. 2023*
- **Encouragement Award for the Undergraduate Research Program** — KAIST
  Earned 10th place out of 65 teams in the Undergraduate Research Program. — *Aug. 2022*
- **College of Engineering Dean's List** — KAIST
  Achieved within the top 3% of academic performance in the Electrical Engineering Department. — *Aug. 2022*
- **School of Freshman Dean's List** — KAIST
  Acheived within the top 2% in academic excellence among Freshman. — *Aug. 2020*
- **Recognition Award** — Gyeonggi Provincial Assembly
  Recognized for exemplary conduct and outstanding academic performance. — *Feb. 2020*

Skills

- **Programming Languages** - Python, C, MATLAB, R, System Verilog
- **Deep Learning Frameworks** - Pytorch, Pytorch Lightning, TensorFlow, Keras
- **Miscellaneous** - Git, Linux, LaTeX, Markdown
- **Language Abilities** - Fluent in English and Native in Korean

Extracurricular Activities

- **LS Dream Science Class** — *Dec. 2019 - Feb. 2020*
  - Participated in a tutoring program for underprivileged students, teaching science for 6 hours per day.
- **The Republic of Korea's Army Sergent** — *Feb. 2018 - Oct. 2019*
  - Served as a supply specialist in an armored battalion.
  - One-month early promotion to sergeant and Corporal, respectively, due to excellence in duty.